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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

February 22, 1994

William F. Caton, Acting Secretary
Federal Communications Commission
1919 M. Street, N.W., Rm 222
Washington, DC 20554

Re: ET Docket No. 93-235, Ex Parte
New Cordless Telephone Frequencies

Dear Mr. Caton:

The Telecommunications Industry Association ("TIA") Mobile & Personal Communications Consumer Radio Section ("the Section) hereby requests that this correspondence be associated with the record of the above-referenced docket. While the Section is aware of §1.415(d) of the Commission's Rules, it believes that the record of this proceeding is incomplete and that the public interest would be served by supplementing that record with the additional information provided herein, on an Ex Parte basis.

Summary

On December 23, 1993, Reply Comments were filed in response to the NPRM issued by the Commission in the above-referenced proceeding. In its Reply Comments, Zenith Electronics Corporation ("Zenith") provides new data relating to the IF (intermediate frequency) immunity of TV receivers to signals in the 41-47 MHz band. Zenith suggests that cordless telephones using the new frequencies proposed in the NPRM would cause significant harmful interference to the reception of TV broadcasts, and that this interference would be substantially greater than the interference caused by cordless telephones using the existing base transmit frequencies. On the basis of these concerns, Zenith opposes the proposal put forth in the NPRM.

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The Section has examined Zenith's concerns and finds that they are considerably overstated. For example, Zenith implies that cordless telephones could interfere with TV sets more than 3 meters away.† Zenith also states that on the basis of its measurements, "interference to TV reception is far more likely in the proposed frequencies (by a factor of 10 to 100 times) compared to the existing frequencies for such devices." ‡ As shown herein, Zenith's own data, when considered together with well-known relationships between field strength and distance, show that a cordless base unit operating at the worst-case proposed new frequency must be within about 2 feet of the TV set to cause interference. Moreover, the 20 dB difference in susceptibility between the proposed and existing frequencies (the factor of 100 noted by Zenith) is not significant because it translates to a difference of only about one foot in required separation distance.

## Analysis

Zenith's "attachment II" is included here as Fig. 1, and Fig. 2 shows the electric field strength vs. distance between the TV set and a cordless telephone base unit, calculated as described in the Appendix to this letter.

Although Zenith does not provide details of the manner in which the measurements were made, the data on Fig. 1 presumably show the electric field strength levels at various frequencies required to produce observable degradation in the TV picture. It will be assumed here that the data shown in Fig. 1 are correct and roughly representative of late-model TV sets in general. Indeed, when considered together with Fig. 2, the data of Fig. 1 seem to be consistent with subjective interference measurements by Section members. However, Zenith has failed to assess the implications of its data in terms of the separation distance required to eliminate the interference and as a result has drawn erroneous conclusions about the severity of the interference problem.

According to Zenith's data, the greatest susceptibility occurs at 44.5-45.0 MHz, where a field strength of -20 dBV/m causes interference. From Fig. 2 this

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† <u>See</u> Zenith at p. 2.

‡ <u>Id.</u>

corresponds to a distance of about 2.2 feet between the cordless telephone base unit and the TV set. That is, a 2.2 foot separation is required to eliminate the interference. This is consistent with subjective measurements made by Section members.

Zenith's data also show that the susceptibility to the new frequencies can be 20 dB worse than to the existing frequencies, which from Zenith's data is roughly 0 dBV/m. From Fig. 2 this level corresponds to approximately a 1-foot separation between the cordless base and the TV set. Therefore, the 20 dB difference between the proposed and existing frequencies in TV IF susceptibility to cordless telephone base unit transmissions translates to roughly a 1-foot difference in the separation required between the cordless telephone base unit and the TV set to eliminate the interference.

## Conclusions

The susceptibility data provided by Zenith, reproduced here as Fig. 1, appear to accurately represent the field strength at which picture degradation can be observed at a given frequency. When coupled with the field strength characteristic in Fig. 2, Zenith's data yield required "protection distances" that are consistent with informal measurements made by Section members. Specifically, separation distances of roughly 2 feet and 1 foot are required to prevent degradation of the TV picture due to interference from cordless telephone base unit using the proposed and existing frequencies, respectively.

Based on these findings, the Section continues to believe that cordless telephones using the new frequencies proposed in the NPRM would not represent a significant interference threat to TV reception.

Respectfully submitted,

Jay E. Padgett
Chairman, TIA MPC
Consumer Radio Section

Daniel L. Bart
Vice President,
Telecommunications Industry
Association

## APPENDIX

### ELECTRIC FIELD STRENGTH VS. SEPARATION IN THE NEAR FIELD

The vertical component of the rms electric field from a vertical dipole $r$ meters away and in the direction of maximum radiation can be expressed in phasor form as*

$$\vec{E}_\theta(r) = K_\theta\left\{(r_0/r)^2 + j\left[r_0/r - (r_0/r)^3\right]\right\},$$

where $r_0 = \lambda/2\pi$ ($\lambda$ is the wavelength), $j = \sqrt{-1}$, and $K_\theta$ depends on the transmitted power. The time-varying field strength is simply $\sqrt{2}\,\mathrm{Re}\{\vec{E}_\theta e^{j\omega t'}\}$, where Re{·} denotes the real part of the argument and $t' = t - r/v$.** Note that $\vec{E}_\theta$ includes three components. The inverse-cubed and inverse-squared terms represent the electrostatic and inductive fields, respectively. The $r_0/r$ term represents the far field, or radiation field. When $r = r_0$ all three components are equal.

The rms field strength $|\vec{E}_\theta|$ is simply the quadrature sum of the real and imaginary components of $\vec{E}_\theta$. Thus, the value of $K_\theta$ can be found by knowing the amplitude of the field at any given value of $r$. For cordless telephones, the field amplitude must be 0.01 V/m at $r = 3$ meters. Assuming a frequency of 44 MHz, $\lambda = 6.82$ m and $r_0 = 1.085$ m. Setting $|\vec{E}_\theta(3)| = 0.01$ gives $K_\theta = 2.94\times10^{-2}$ V/m, and $|\vec{E}_\theta|$ may be computed for any value of $r$, as shown in Fig. 2.

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* For details see E. C. Jordan and K. G. Balmain, *Electromagnetic Waves and Radiating Systems,* second ed., Englewood Cliffs, NJ: Prentice-Hall, 1968, pp. 317-320.

** The propagation velocity $v$ is normally taken as the speed of light.

# IF IMMUNITY TO AN EXTERNAL FIELD

## REPRESENTATIVE MODEL IN A TEM CELL, 10 KHZ FM CARRIER

### Monoscope pattern on channel 2

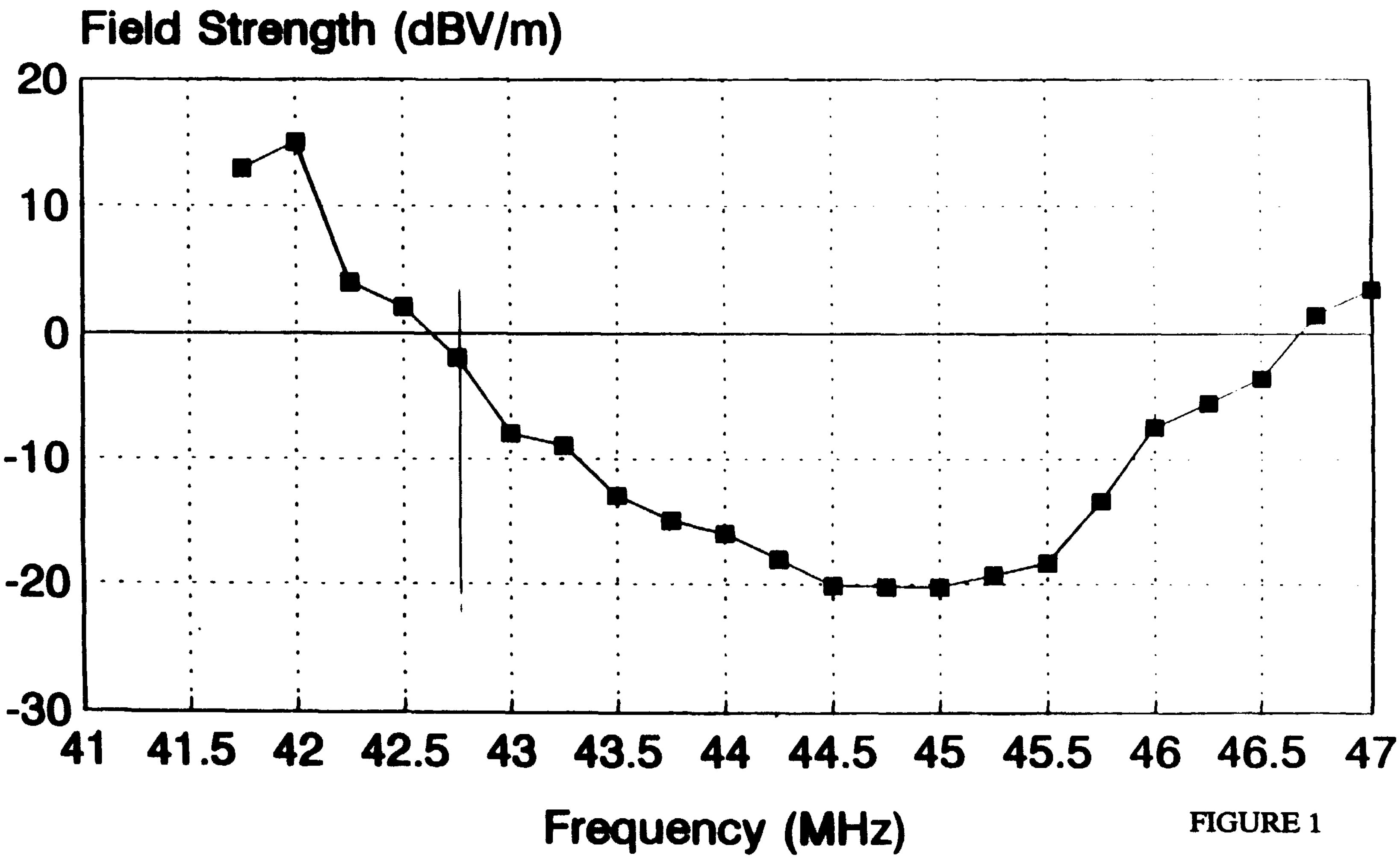


FIGURE 1

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Reproduced from the Reply Comments of Zenith Electronics Corporation in ET Docket 93-235

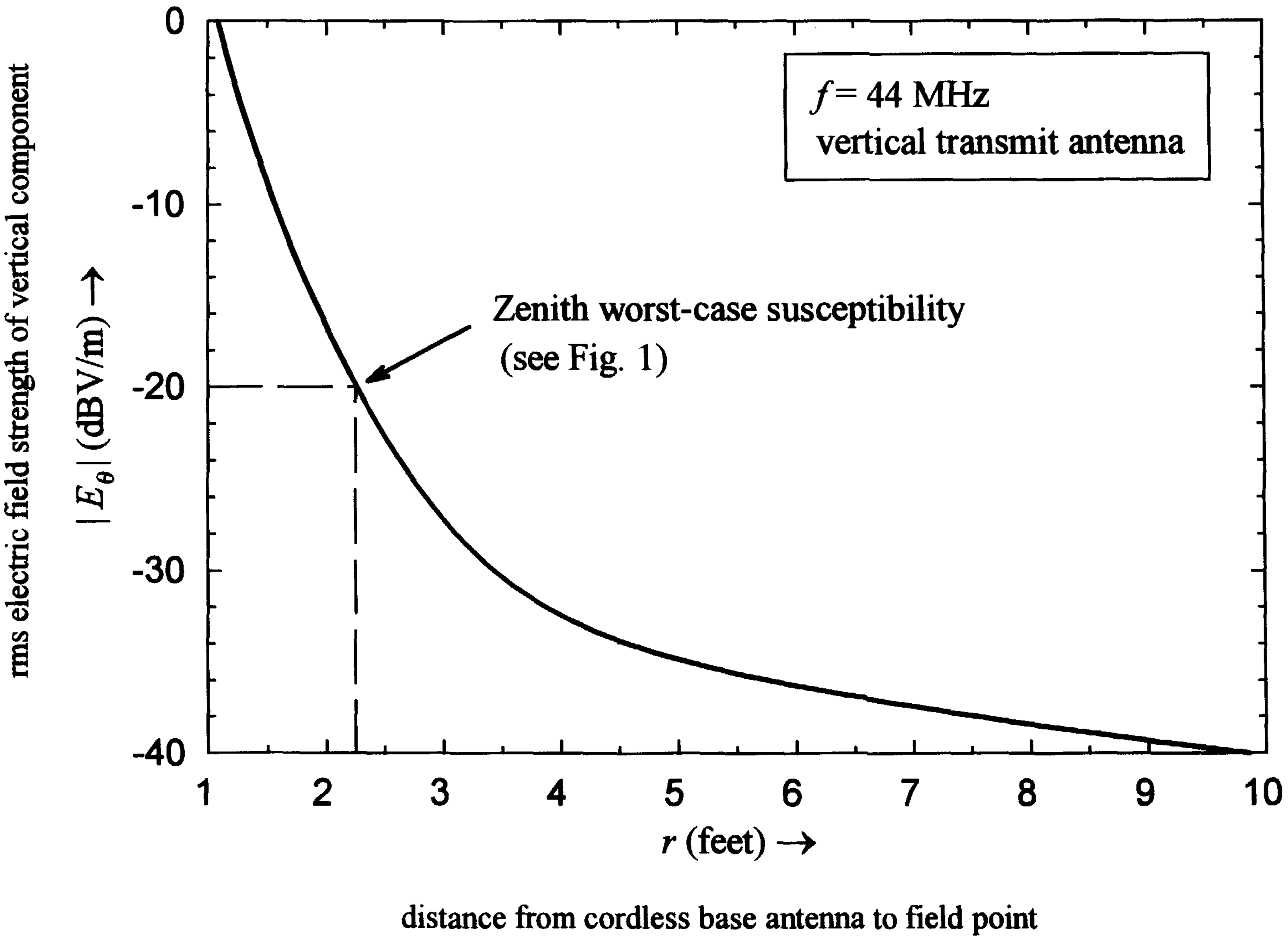


Figure 2: Electric field strength vs. distance from a cordless base station antenna.